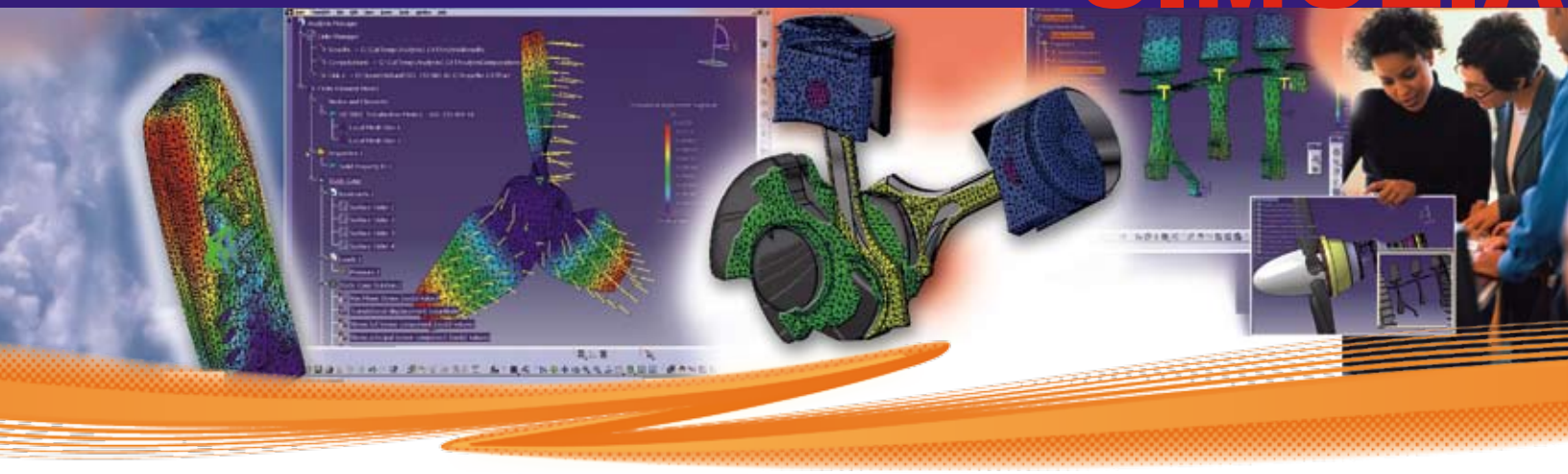


FEM Surface (FMS)

Provides advanced surface and wireframe meshing capability for complex surface parts

Overview

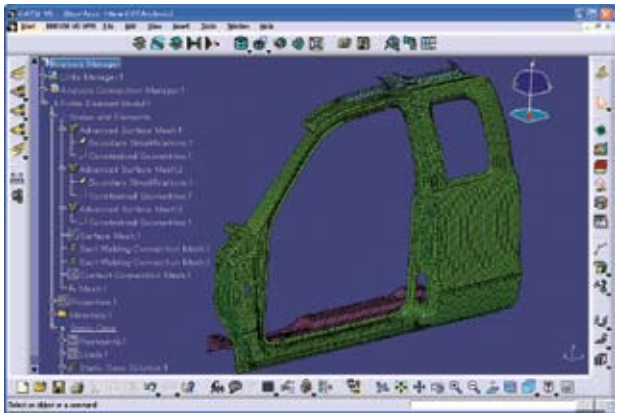
FMS provides advanced meshing capability for complex surface and wireframe parts. Meshes generated on geometry are fully associative with the geometry and FMS provides more control and more sophisticated meshing algorithms than the standard surface meshing capability in GPS.

FMS is intended for the specialist that wants to mesh complex surface and wireframe geometry quickly and efficiently, while retaining a lot of control over the resulting element quality and the number of elements in the mesh. The sophisticated meshing algorithms allow complex parts to be meshed automatically, but manual mesh editing tools are also available for the user that requires ultimate control of the meshing process. FMS respects assembly joints when creating the mesh, including spot and seam welds and other types of fasteners. Various pre-defined and customizable criteria for mesh quality can be displayed.

GPS is the backbone of the CATIA V5 Analysis solution. The other five CATIA Analysis products are combined with GPS to extend its integrated analysis capabilities.

Product Highlights

- Automatic surface meshing incorporating geometric simplification.
- Meshes are fully associative with the geometry.
- High degree of user control of the meshing process.
- Interactive mesh editing tools for ultimate control over the mesh.
- Compatible and non-compatible meshing.
- Color visualization and analysis of mesh quality.
- Automated meshing using Knowledgeware.
- Mesh smoothing.



Assembly mesh of a car door using compatible spot welded connections

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Features and Benefits

In addition to the functionalities and benefits provided by Generative Part Structural Analysis (GPS), FEM Surface (FMS) offers:

Advanced meshing of surfaces based on geometry simplification

The meshing algorithms automatically simplify the geometry ensuring that small geometric features do not adversely affect the size and quality of the resulting mesh, and avoiding difficult, time-consuming clean-up of geometry.

Mesh associative with design

The mesh is fully associative to the surface geometry from which it was created: any changes to the geometry will automatically cause the mesh to be updated. Controls to maintain the topology are provided to generate a surface and wireframe mesh that is acceptable to the most discriminating analysts. Throughout the meshing process, the referenced geometry is never modified. The mesh works with an exact replica of the geometry as a clone, respecting all the geometric characteristics and adapting those characteristics to the needs of the mesh without impacting the original design geometry.

Compatible and incompatible meshing

FMS allows both compatible and incompatible meshes between parts in an assembly. The choice to generate a compatible or incompatible mesh for assembly joints depends on the customers' methodologies and the desired balance between computation speed and the accuracy of the results. Spot and seam welds can be defined based on incompatible elements, allowing the weld locations to be adjusted without impacting previously generated meshes. Alternatively, they can be based on compatible elements when a high level of accuracy is required, such as fatigue analysis, or when a continuous mesh is required, such as for impact analysis.

Rapid mesh creation

FMS provides a set of tools to quickly generate finite elements directly. This includes the ability to transform mesh parts by translation and rotation, to capture exiting meshes to create new ones while respecting mesh constraints, and to position the mesh at the mid-surface of the geometry by offsetting the mesh.

Mesh control

Local mesh constraints can be applied quickly and easily to control the meshing of complex surface parts. These constraints can be applied directly to the geometry or to the nodes and elements. Local element sizes can also be assigned to the geometry prior to meshing. Intersections or overlap of meshes can be detected, which is especially useful in large assemblies with multiple meshes.

Quality analysis and mesh editing

The quality of the mesh can be visualized directly on the mesh and elements not conforming to the selected quality criteria can be grouped, making it easier to modify them. The quality criteria dynamically update as the user edits the mesh by interactively moving nodes on the geometry, editing elements (splitting, swapping, etc.), or smoothing the mesh. The auto-focus capability saves considerable time by automatically identifying the areas to be improved.

Knowledge-based technology

The specification parameters of FMS (including the meshing domain, node distribution, meshing capture tolerance, meshing size, etc.) are available as knowledge parameters. As a result, they can be used to produce advanced parameterized models to automate the meshing process and to ensure compliancy with corporate standards.

Flexible quality analysis reports

The analysis of the mesh is provided in charts and text. Users can filter information provided in the report by quality criterion or by finite element type. If the quality criterion is chosen, users can obtain the percentage of the mesh's finite elements that respect the threshold value for each criterion. When sorted by finite element, users will see the results of the quality evaluation for each finite element. This capability enhances communication between users or groups of users which is especially important when working with large part assemblies.

SIMULIA World Headquarters
166 Valley Street
Providence, RI 02909 USA
+1 401 276 4400
E-mail: simulia.info@3ds.com

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